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Short communication

Higuchi's transverse incision and a modification of this method for minimally invasive surgery

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ABSTRACT

Study Objective: To describe Higuchi's transverse incision and a modification of this method for reduced port surgery (RPS).**Design:** Descriptive study.**Setting:** University hospital.**Patients:** Those with ovarian cyst and uterine myoma.**Intervention:** A platform is placed in the 2–3 cm Higuchi incision just above the pubis or on the pubis. Blunt dissection of the subcutaneous adipose tissue is performed. A T incision of the rectus abdominis fascia and a longitudinal incision of the peritoneum are performed. A LAP PROTECTOR and EZ access (Hakko Medical, Nagano, Japan) are used with the platform for single-incision laparoscopic surgery. The peritoneum and fascia are closed by continuous suture, and the skin is closed using the dermostitch technique.**Main Results:** Higuchi's transverse incision is 2–3 cm in length and is made at a much lower position than the conventional Pfannenstiel transverse incision. The wound is covered by pubic hair, yielding an excellent esthetic outcome. The T incision of the rectus abdominis fascia secures a more extensive surgical field than the Pfannenstiel transverse incision.**Conclusion:** Higuchi's modified transverse incision ensures a sufficient visual field, yields an excellent esthetic outcome, and is safe, suggesting the potential use of this method for RPS.Copyright © 2017, The Asia-Pacific Association for Gynecologic Endoscopy and Minimally Invasive Therapy. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Higuchi's transverse incision was established by Shigeji Higuchi, the first chief professor of Obstetrics and Gynecology at the Jikei University School of Medicine (Tokyo, Japan) in the 1910s.¹ Higuchi's transverse incision is made at a lower position than the conventional Pfannenstiel transverse incision, and it is superior in terms of esthetic outcomes. This method is characterized by the T incision of the rectus abdominis fascia, which results in securing a more extensive surgical field than the Pfannenstiel transverse

incision. Higuchi's transverse incision has been a standard approach in laparotomy for benign tumors (except for giant tumors) and for cesarean sections at the Jikei University School of Medicine and related hospitals for more than 100 years.

Recently, the use of reduced port surgery (RPS) such as single-incision laparoscopic surgery (SILS) and laparoscopic surgery using thin forceps has spread not only in gynecology but also in surgery, urology, and other fields. The most common approach in SILS involves a 2.5–3-cm skin incision in the umbilicus, and the suture incision wound usually appears to be <2 cm. However, some patients prefer not to have a wound in the umbilicus for esthetic reasons.

Considering the advantages concerning esthetic outcomes and securing a more extensive surgical field, we have applied Higuchi's transverse incision in RPS for ovarian cyst and uterine myoma, and describe this surgical procedure with the objective of further improving esthetic outcomes.

Conflicts of interest: The authors have no conflicts of interest relevant to this article.

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Procedure

Higuchi's original transverse incision for benign tumors and for cesarean sections

The skin incision is made at a low position, 1.5 cm above the pubis (Figure 1A). The wound is covered by pubic hair, thus yielding an excellent esthetic outcome. The extensive use of blunt dissection of subcutaneous adipose tissue makes it possible to avoid abdominal wall blood vessel injury (Figure 1B). The dissection of subcutaneous adipose tissue should extend at least 3 cm in length cranial to the skin incision. This procedure is important to prevent bladder injury and secure a sufficient surgical field. After bluntly extending the rectus abdominis fascia incision from 2 cm to 3 cm cranial to the skin incision line in a transverse direction to the lateral margin of the rectus abdominis (Figure 1C), a longitudinal incision is made toward the area directly above the pubic symphysis (Figure 1D). The opening of a T incision in the rectus abdominis fascia ensures a sufficient visual field (Figure 1E). Next, longitudinal incision of the peritoneum is performed. Treatment of the peritoneum while confirming and separating the bladder from the peritoneum makes it possible to avoid bladder injury (Figure 1F). Again, this approach secures a more extensive surgical field than the Pfannenstiel transverse incision (Figure 1G). As for abdominal closure, peritoneum and fascia are closed by continuous suture (Figures 1H, 1I, and 1J), and the skin is closed using the dermostitch technique.

Higuchi's modified transverse incision for low-position SILS

A platform is placed in the 2–3-cm Higuchi incision just above the pubis or on the pubis (Figures 2A and 2B). Blunt dissection of the subcutaneous adipose tissue (Figure 2C), a T incision of the rectus abdominis fascia (Figures 2D, 2E, and 2F), and a longitudinal incision of the peritoneum are performed according to Higuchi's original transverse incision (Figures 2G and 2H). Special attention is required to avoid bladder injury (Figures 2I-1 and 2I-2). A LAP PROTECTOR and EZ access (Hakko Medical, Nagano, Japan) are used

with the platform for SILS (Figure 2J). Three Versaport trocars (Covidien, Tokyo, Japan) can be attached to the EZ access, and a 5-mm flexible videoscope (Olympus, Tokyo, Japan) is used to observe the tumor site, tumor size, and possible presence of adhesions following pneumoperitoneum. This method can be performed for ovarian cyst and uterine leiomyoma cases. As for abdominal closure, peritoneum and fascia are closed by continuous suture (Figures 2K, 2L, and 2M), and the skin is closed using the dermostitch technique (Figure 2N).

Wound repair management

We apply Steri-Stri reinforced skin closures (3M Health Care, Tokyo, Japan) and prescribe tranilast (RIZABEN Cap; Kissei Pharmaceutical Co., Ltd, Matsumoto, Nagano, Japan) and fludrocortisone (DORENIZON; Sumitomo Dainippon Pharma, Tokyo, Osaka, Japan). Figure 2O shows the wound 2 weeks after the surgery. Figure 2P shows the wound 2 months after the surgery. Figure 2Q shows that the wound is hidden by pubic hair 4 months after the surgery.

Discussion

Higuchi's original transverse incision compares to the conventional Pfannenstiel transverse incision in four ways. (1) The incision can be made at a lower position, 1.5 cm above the pubis; thus, the wound is covered by pubic hair, yielding an excellent esthetic outcome. In addition, this incision also enables easier operations on the bladder, cervix, and elsewhere in the pelvis. (2) The extensive use of blunt dissection of the subcutaneous adipose tissue makes it possible to prevent abdominal wall blood vessel injury. (3) The main characteristic of Higuchi's incision is a T incision of the rectus abdominis fascia. Bluntly extending the incision in a transverse direction prevents injury to the perforating branches of the deep arteries and veins of the abdominal wall. Next, a longitudinal incision is made directly above the pubic symphysis. Treatment of the peritoneum while confirming the bladder makes it possible to

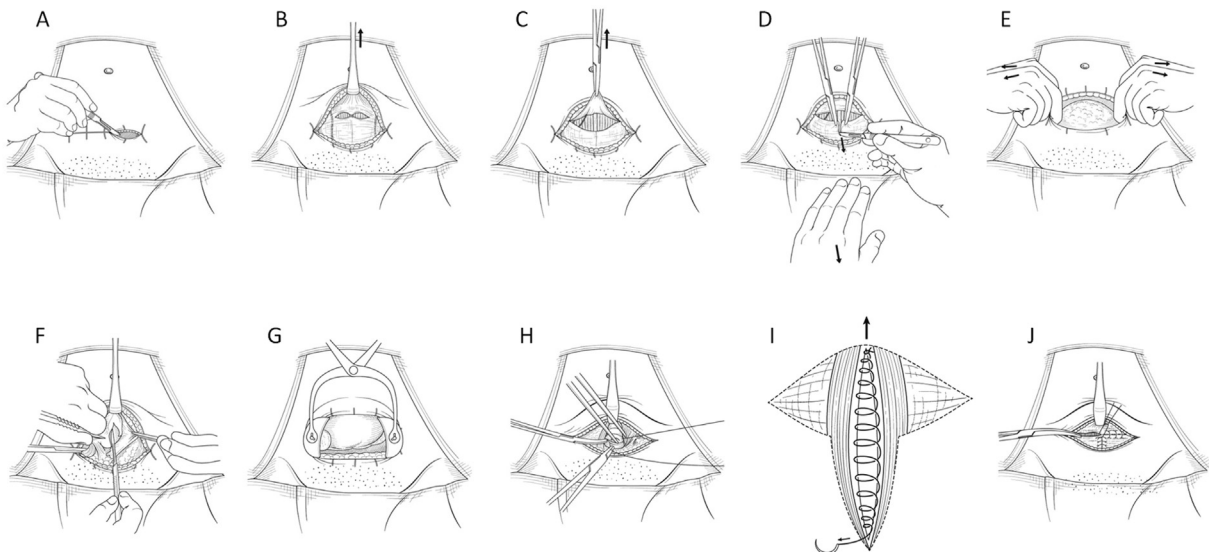


Figure 1. Higuchi's original transverse incision for benign tumors and cesarean sections. (A) The incision is made at a low position, 1.5 cm above the pubis. (B) The extensive use of blunt dissection of subcutaneous adipose tissue makes it possible to avoid abdominal wall blood vessel injury. (C) The rectus abdominis fascia incision is bluntly extended from 2 cm to 3 cm cranial to the skin incision line in a transverse direction to the lateral margin of the rectus abdominis. (D) A longitudinal incision is made toward the area directly above the pubic symphysis. (E) The opening of a T incision in the rectus abdominis fascia ensures a sufficient visual field. (F) Treatment of the peritoneum while confirming and separating the bladder from the peritoneum makes it possible to avoid bladder injury. (G) This approach secures a more extensive surgical field than the Pfannenstiel transverse incision. (H–J) The peritoneum and fascia are closed by continuous suture.

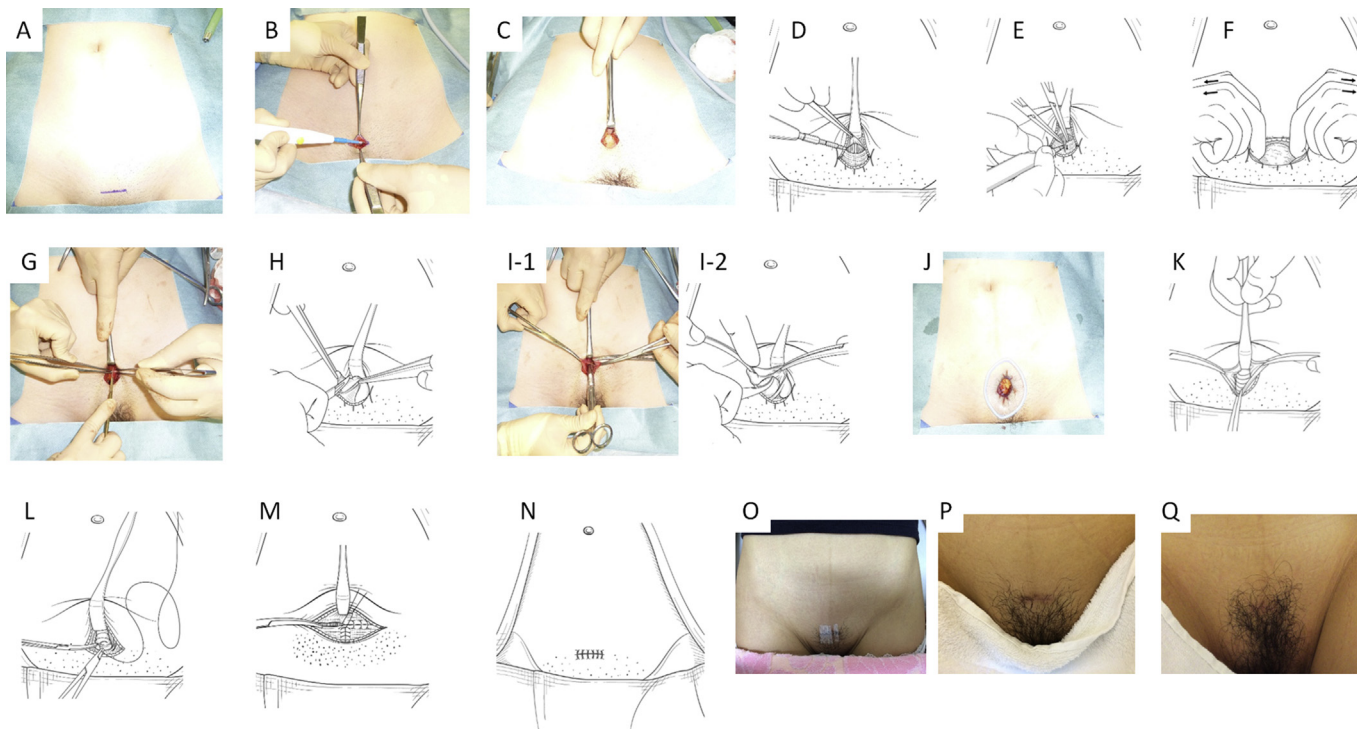


Figure 2. Higuchi's modified transverse incision for low-position single-incision laparoscopic surgery. (A, B) A platform is placed in the 2–3 cm Higuchi incision just above the pubis or on the pubis. (C) Blunt dissection of subcutaneous adipose tissue is performed. (D–F) A T incision of the rectus abdominis fascia is made. (G, H) A longitudinal incision of the peritoneum is performed according to Higuchi's original transverse incision. (I-1, I-2) Special attention is required to avoid bladder injury. (J) A LAP PROTECTOR and EZ access (Hakko Medical, Nagano, Japan) are used with the platform for single-incision laparoscopic surgery. (K–M) The peritoneum and fascia are closed by continuous suture. (N) The skin is closed with the dermostitch technique. (O) The wound 2 weeks after the surgery. (P) The wound 2 months after the surgery. (Q) The wound is hidden by pubic hair 4 months after the surgery.

prevent bladder injury and ensure a sufficient visual field. (4) The skin, fascia, and peritoneum incision sites do not coincide, thus making it possible to prevent an abdominal incisional hernia. We perform Higuchi's transverse abdominal wall incision as a standard approach for laparotomy for benign tumors and cesarean sections.

In recent years, in accordance with the need to further reduce invasiveness in laparoscopy, the application of RPS has become widespread. Single-port umbilical laparoscopic surgery, a form of RPS, was reported in 2005 as a novel approach for tubal pregnancy²; thereafter, its use has grown beyond laparoscopic surgery for benign tumors, and it has also been introduced for malignant tumors and in robotic surgeries.^{3,4} Higuchi's modified transverse incision for low-position (L-SILS), which we introduced in the present study, is an extremely simple method that permits extracorporeal tumor resection and removal of the tumor content in a short time. In addition, applying Higuchi's incision allows a skin incision just above or on the pubis, which causes the wound to be hidden completely by pubic hair and underwear, thereby providing excellent esthetic outcomes. This procedure can be applied for ovarian cyst and uterine leiomyoma cases including laparoscopic myomectomy and laparoscopically assisted myomectomy. However, to avoid bladder injury and obtain a sufficient surgical field in obesity cases, we recommend using this method for transverse incision laparotomy prior to applying it to RPS. We do not recommend this method for patients with pelvic adhesions, especially severe adhesion at the *cul-de-sac*.

Natural orifice transluminal endoscopic surgery (NOTES) is a new approach for RPS in which single-port laparoscopy is performed through a natural orifice such as the mouth, anus, vagina, or urethra without performing an incision in the abdomen. Since transvaginal NOTES in cholecystectomy was first described by

Marescaux in 2007, this technique has been used in various surgeries as minimally invasive surgery.^{5–7} In gynecology, NOTES is performed for adnexal procedures, hysterectomy, and pelvic lymphadenectomy.^{8–10} By applying Higuchi's modified transverse incision for L-SILS to transvaginal NOTES, it may be possible to expand the indication to cases of giant fibroids and endometriosis with advanced adhesion, which are difficult to treat by pure NOTES.

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